

ABSTRACT OF THE DISCLOSURE

An integrated circuit lithography technique called spectral engineering by Applicants, for bandwidth control of an electric discharge laser. In a preferred process, a computer model is used to model lithographic parameters to determine a desired laser spectrum needed to produce a desired lithographic result. A fast responding tuning mechanism is then used to adjust center wavelength of laser pulses in a burst of pulses to achieve an integrated spectrum for the burst of pulses approximating the desired laser spectrum. The laser beam bandwidth is controlled to produce an effective beam spectrum having at least two spectral peaks in order to produce improved pattern resolution in photo resist film. Line narrowing equipment is provided having at least one piezoelectric drive and a fast bandwidth detection control system having a time response of less than about 2.0 millisecond. In a preferred embodiment, a wavelength tuning mirror is dithered at dither rates of more than 500 dithers per second in phase with the repetition rate of the laser. In one case, the piezoelectric drive was driven with a square wave signal and in a second case it was driven with a sine wave signal. In another embodiment, the maximum displacement was matched on a one-to-one basis with the laser pulses in order to produce a desired average spectrum with two peaks for a series of laser pulses. Other preferred embodiments utilize three separate wavelength tuning positions producing a spectrum with three separate peaks.